Amendments to the Claims:

This listing of Claims will replace all prior versions and listings of Claims in the Application.

Listing of Claims:

Please Amend the Claims as Follows:

1- 22 (cancelled)

23. (new) An integrated photoacoustic spectroscopy cell, comprising:

a structure including an inner layer sandwiched between top and bottom outer layers, the inner layer being patterned to include an open-tube resonant cavity with buffer cavities formed on either side thereof; and one or both of the top and bottom outer layers being patterned to include a portion of the buffer cavities on either side of the resonant cavity; and

a piezoelectric thin-film sensor formed on one of the outer layers and a port acoustically coupling the sensor to the resonant cavity.

24. (new) The integrated photoacoustic spectroscopy cell according to claim 23, including gas inlet and outlet ports formed through one or both of the outer layers and into the buffer cavities.

25. (new) The integrated photoacoustic spectroscopy cell according to claim 23, wherein the layers are silicon wafers.

26. (new) An integrated photoacoustic spectroscopy cell, comprising:

a multi-layer structure for receiving a gas sample for the spectroscopy cell and having an inner layer disposed between top and bottom outer layers, with the inner layer being patterned to form a resonant cavity; and

a thin-film membrane microphone formed on one of the outer layers and acoustically coupled to the resonant cavity.

27. (new). An integrated photoacoustic spectroscopy cell, comprising:

a multi-layer structure for receiving a gas sample for the spectroscopy cell and having an inner layer disposed between top and bottom outer layers, with the inner layer being patterned to form a resonant cavity; and

a thin-film microphone formed on one of the outer layers and acoustically coupled to the resonant cavity, wherein at least the inner layer is patterned to include buffer cavities on either side of the resonant cavity.

28. (new) The integrated photoacoustic spectroscopy cell according to claim 27, wherein one or both of the top and bottom outer layers are patterned to include buffer cavities aligned with the buffer cavities in the inner layer formed on either side of the resonant cavity.

29. (new) The integrated photoacoustic spectroscopy cell according to claim 27, further including gas inlet and outlet ports through one or both of the outer layers and into the buffer cavities.

30. (new) The integrated photoacoustic spectroscopy cell according to claim 27, wherein the thin-film microphone is a piezoelectric microphone.

31. (new) The integrated photoacoustic spectroscopy cell according to claim 27, wherein the thin-film microphone is acoustically coupled to the resonant cavity through an acoustic port in communication with the resonant cavity.

32. (new) The integrated photoacoustic spectroscopy cell according to claim 27, wherein the layers are silicon wafers.

33. (new) A method of fabricating a photoacoustic spectroscopy cell formed of top, bottom and inner substrates, comprising the steps of:

forming a resonant cavity and buffer cavities on either side of the resonant cavity in the inner substrate;

joining the inner substrate to a pair of top and bottom outer substrates, thereby encapsulating the resonant cavity; and

acoustically coupling a microphone to the resonant cavity.

34. (new) The method of claim 33, wherein the top substrate is a silicon substrate having top and bottom surfaces, and successive layers of silicon dioxide, a piezoelectric thin-film material and platinum are deposited on the top surface of the top substrate.

35. (new) The method of claim 34, wherein successive layers of silicon dioxide and gold alloy are deposited on the bottom surface of the top substrate.

36 (new) The method of claim 33, wherein the bottom substrate is a silicon substrate covered with a layer of silicon and patterned with ion etching to form ports and buffer regions.

37. (new) The method of claim 33, wherein the inner substrate is a silicon substrate with gold alloy formed on both surfaces of the substrate and with resonant cavity and buffer regions formed in the inner substrate using ion etching.

38. (new) The method of claim 33, the substrates are silicon substrates and further including the step of forming buffer cavities in one or both of the top and bottom substrates in alignment with buffer cavities formed in the inner substrate.

39 (new) The method of claim 33, wherein the substrates are silicon coated with one of titanium-gold or tin-gold alloy and further including the step of using temperature and pressure to form a gold-silicon or gold-tin eutectic bond between the substrates.

40 (new) The method of claim 33, wherein the substrates are silicon and wherein the step of acoustically coupling a microphone to the resonant cavity includes the steps of:

depositing a piezoelectric thin film onto one of the top and bottom substrates;

etching and patterning the thin film to create an acoustic sensor; and

forming a port extending from the acoustic sensor into the resonant cavity.

41. (new) The method of claim 40, wherein the substrates are silicon material coated with one of titanium-gold or tin-gold alloy and further including the step of compressing the substrates together and using temperature and pressure to form a gold-silicon or gold-tin eutectic bond between the substrates.

42. (new) The method of claim 40 wherein the piezoelectric thin film is selected from the group of lead zirconate titanate (PZT), aluminum nitride (AlN), and zinc oxide (ZnO).